



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/726,787	12/02/2003	Michael J. Koster	SUN-P8985-SPL	6112

22835 7590 05/10/2006

A. RICHARD PARK, REG. NO. 41241
PARK, VAUGHAN & FLEMING LLP
2820 FIFTH STREET
DAVIS, CA 95616

EXAMINER

BARTON, JONATHAN A

ART UNIT	PAPER NUMBER
----------	--------------

2186

DATE MAILED: 05/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/726,787	Applicant(s) KOSTER ET AL.	
	Examiner Jonathan Barton	Art Unit 2186	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 March 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Objections

1. Claim 9 is objected to because of the following informalities:
 - a. Line 2 should read "broadcast an update **to** other caches".
 - b. Lines 2-3 should read "when the given cache **line** is updated in a local cache". *Appropriate correction is required.*

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
2. Claim 7 recites the limitation "the shared memory multiprocessor" in line 1.

There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-3, 8-12, 17-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Manasse (US 5,345,578).

- a. As for claims 1, 10, 19 and 20 Manasse discloses

- i. initializing a cache to operate using a write-invalidate protocol (Col. 6 Lines 62-66 - Manasse initializes to operate using a write-broadcast protocol, but since his invention switches between the two protocols as needed, the initial protocol chosen does not constitute patentable subject matter.);
 - ii. monitoring a dynamic behavior of the cache during program execution (Col. 6 Lines 52-59); and
 - iii. switching the cache to operate using a write-broadcast protocol if the dynamic behavior indicates that better performance can be achieved using the write-broadcast protocol (Col. 6 Lines 42-45, Col. 14 Lines 45-47).
- b. As for claim 2 and 11 Manasse discloses
 - iv. monitoring the dynamic behavior of the cache involves monitoring the dynamic behavior of the cache on a cache-line by cache-line basis (Col. 5 Lines 4-6, Col. 6 Lines 52-62).
- c. As for claim 3 and 12 Manasse discloses
 - v. switching to the write-broadcast protocol involves switching to the write-broadcast protocol on a cache-line by cache-line basis (Col. 5 Lines 4-6, Col. 6 Lines 42-45, Col. 14 Lines 45-47).
- d. As for claim 8 and 17 Manasse discloses

- vi. the write-invalidate protocol sends an invalidation message to other caches in a shared memory multiprocessor when a given cache line is updated in a local cache (Col. 2 Lines 4-15).
- e. As for claim 9 and 18 Manasse discloses
 - vii. the write-broadcast protocol broadcasts an update other caches in a shared memory multiprocessor when the given cache is updated in a local cache (Col. 2 Lines 16-29).
- f. As for claim 19 Manasse additionally discloses
 - viii. a plurality of processors, wherein a processor within the plurality of processors includes a cache (Col. 3 Lines 27-29, Col. 2 Lines 46-48);
 - ix. a shared memory (Col. 3 Lines 20-22);
 - x. a bus coupled between the plurality of processors and the shared memory, wherein the bus transports addresses and data between the shared memory and the plurality of processors an initializing mechanism configured to initialize the cache to a write-invalidate protocol (Col. 3 Lines 7-9, Col. 4 Lines 29-31).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 4-7 and 13-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Manasse (US 5,345,578) in view of Rand (US 2003/0126372).

g. As for claim 4 and 13 Manasse fails to disclose the following limitation, which is disclosed by Rand:

xi. monitoring the dynamic behavior of the cache involves maintaining a count for each cache line of the number of cache line invalidations the cache line has been subject to during program execution (Par. 45).

xii. It would have been obvious to one of ordinary skill in the art at the time of the invention to have combined the invalidation count of Rand with the snoop protocol switching invention of Manasse because both systems are intended to aid and improve cache coherency and the invalidation count would give further data and control to operate Manasse's system.

h. As for claim 5 and 14 Manasse discloses

xiii. if the number of cache line invalidations indicates that a given cache line is updated frequently, switching the cache line to operate under the write-broadcast protocol (Col. 6 Lines 59-66).

i. As for claim 6 and 15 Manasse discloses

xiv. if a given cache line is using the write-broadcast protocol and the number of cache line updates indicates that the given cache line is not being contended for by multiple processors, switching the given cache line back to the write-invalidate protocol (Col. 6 Lines 42-45, Col. 14 Lines 45-47).

Art Unit: 2186

j. As for claim 7 and 16 Manasse discloses

xv. If the shared memory multiprocessor includes modules that are not able to switch to the write-broadcast protocol, the method further comprises locking the cache into the write-invalidate protocol (Col. 2 Lines 33-44).

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

k. Chauvel et al. (US 2002/0065992).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Barton whose telephone number is 571-272-8157. The examiner can normally be reached on Monday - Friday 8:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matt Kim can be reached on 571-272-4182. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2186

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jonathan Barton
Examiner
Art Unit 2186

JB

DETAILED ACTION

1. This Office Action is in response to the amendment filed by Applicant on 3/30/2006.
 - a. The objections to claim 9 have been overcome by the amendments to the claim.
 - b. The rejection under 35 U.S.C. 112, second paragraph has been overcome by the amendment to the claim.
 - c. The rejections to claims 1-20 under 35 U.S.C 102(b) and 35 U.S.C. 103(a) have not been overcome by the amendments to the claims or the remarks made by Applicant, and as such the claims stand rejected.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-3, 8-12, 17-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Manasse (US 5,345,578).
 - a. As for claims 1, 10, 19 and 20 Manasse discloses
 - i. initializing a cache to operate using a write-invalidate protocol (Col. 6 Lines 62-66 - Manasse initializes to operate using a write-broadcast protocol, but since his invention switches between the two protocols as

Art Unit: 2186

needed, the initial protocol chosen does not constitute patentable subject matter.);

ii. monitoring a dynamic behavior of the cache during program execution (Col. 6 Lines 52-59); and

iii. if the dynamic behavior indicates that better performance can be achieved using a write-broadcast protocol switching the cache to operate using the write-broadcast protocol (Col. 6 Lines 42-45, Col. 14 Lines 45-47).

b. As for claim 2 and 11 Manasse discloses

iv. monitoring the dynamic behavior of the cache involves monitoring the dynamic behavior of the cache on a cache-line by cache-line basis (Col. 5 Lines 4-6, Col. 6 Lines 52-62).

c. As for claim 3 and 12 Manasse discloses

v. switching to the write-broadcast protocol involves switching to the write-broadcast protocol on a cache-line by cache-line basis (Col. 5 Lines 4-6, Col. 6 Lines 42-45, Col. 14 Lines 45-47).

d. As for claim 8 and 17 Manasse discloses

vi. the write-invalidate protocol sends an invalidation message to other caches in a shared memory multiprocessor when a given cache line is updated in a local cache (Col. 2 Lines 4-15).

e. As for claim 9 and 18 Manasse discloses

Art Unit: 2186

- vii. the write-broadcast protocol broadcasts an update other caches in a shared memory multiprocessor when the given cache is updated in a local cache (Col. 2 Lines 16-29).
- f. As for claim 19 Manasse additionally discloses
 - viii. a plurality of processors, wherein a processor within the plurality of processors includes a cache (Col. 3 Lines 27-29, Col. 2 Lines 46-48);
 - ix. a shared memory (Col. 3 Lines 20-22);
 - x. a bus coupled between the plurality of processors and the shared memory, wherein the bus transports addresses and data between the shared memory and the plurality of processors an initializing mechanism configured to initialize the cache to a write-invalidate protocol (Col. 3 Lines 7-9, Col. 4 Lines 29-31).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

- 2. Claims 4-7 and 13-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Manasse (US 5,345,578) in view of Rand (US 2003/0126372).

- g. As for claim 4 and 13 Manasse fails to disclose the following limitation, which is disclosed by Rand:
 - xi. monitoring the dynamic behavior of the cache involves maintaining a count for each cache line of the number of cache line invalidations the cache line has been subject to during program execution (Par. 45).
 - xii. It would have been obvious to one of ordinary skill in the art at the time of the invention to have combined the invalidation count of Rand with the snoop protocol switching invention of Manasse because both systems are intended to aid and improve cache coherency and the invalidation count would give further data and control to operate Manasse's system.
- h. As for claim 5 and 14 Manasse discloses
 - xiii. if the number of cache line invalidations indicates that a given cache line is updated frequently, switching the cache line to operate under the write-broadcast protocol (Col. 6 Lines 59-66).
- i. As for claim 6 and 15 Manasse discloses
 - xiv. if a given cache line is using the write-broadcast protocol and the number of cache line updates indicates that the given cache line is not being contended for by multiple processors, switching the given cache line back to the write-invalidate protocol (Col. 6 Lines 42-45, Col. 14 Lines 45-47).
- j. As for claim 7 and 16 Manasse discloses

xv. If the shared memory multiprocessor includes modules that are not able to switch to the write-broadcast protocol, the method further comprises locking the cache into the write-invalidate protocol (Col. 2 Lines 33-44).

Response to Arguments

1. Applicant's arguments filed 3/30/2006 have been fully considered but they are not persuasive.

a. With regard to claims 1, 10, 19, 20 (and subsequently their dependent claims):

i. Applicant states that Manasse teaches performing an "update or invalidate" if data is present elsewhere along one of the buses. The citation pointed to by Applicant to support this is not a portion or feature of Manasse's disclosure that Examiner is relying upon for purposes of this rejection, and in no way degrades the strength of the rejection. Therefore this argument is moot.

ii. Applicant states that Manasse fails to disclose "switching protocols". Examiner points to the "exclusive write strategy" and "pack rat strategy" disclosed by Manasse (Col. 5 Lines 39-55). These two "strategies" perform the same function as Applicant's "protocols". Manasse discloses switching between his two "strategies" based upon a count ratio (Col. 6 Lines 35-51). Manasse does not use the word "switch" to describe

this operation, however he uses the exclusive-write strategy until a condition has been met, and then uses the pack rat strategy upon the meeting of the condition. Examiner fully believes this to be synonymous with "switching".

iii. The counting done in Manasse is equivalent to the "dynamic behavior" discussed by Applicant (Col. 6 Lines 46-66).

iv. Applicant further argues that "the system of Manasse, even though it allows either protocol, does not *switch* protocols based upon the dynamic behavior of the program execution." The "switching" and "dynamic behavior" issues have been explained in the preceding paragraphs, and this explanation applies equivalently here.

v. Although Manasse does not disclose the same names for the features and methods of his invention, the operation and function are, as discussed, in fact the same as those of claimed invention of the instant application.

Conclusion

2. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

Art Unit: 2186

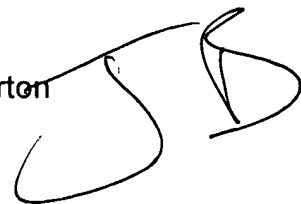
mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Barton whose telephone number is 571-272-8157. The examiner can normally be reached on Monday - Friday 8:30 - 5:00.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matt Kim can be reached on 571-272-4182. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jonathan Barton
Examiner
Art Unit 2186



JB



MATTHEW KIM
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100